Reply to the comments of Illenberger and Märk (MS. No. LLK634) on O. J. Orient and A. Chutjian, in *Phys. Rev. Lett. 74*, 5017 (1995).

Orient and Chutjian Reply: The authors have questioned our detection of three exit channels, and their intensities, in O^-/NO production *via* dissociative attachment (DA) [1]. These questions have been raised both here and in Ref. 2. We address them here.

Fields and Trajectories: The reason for use of a high magnetic field B was to raise the space-charge limited currents available at the attachment region. This was partly historical in nature, as the instrument was used for generating high fluxes of fast, neutral O-atom beams [3]. We have carried out to date a fully three-dimensional fields-and-trajectories modeling of the collision region and the trochoidal monochromator TM which included fringing, beam shear, field-penetration, and lens-aberration effects for our specific experimental geometry. An isotropic differential scattering cross section (DCS) was assumed. Calculations also included full electron and ion space charge, and a nonzero spatial width of the confined ion beam (taken to be equal to a Gaussian width of the electron beam of 0.05 mm FWHM). At the currents used no space charge effects are observed for either the electron or ion beams. Our calculations, when combined with the relative peak intensities [1], fully reproduce the E_e = 9.0 and 10.0 eV spectra which show the three peaks [1]. Differences in calculated intensities would result if the scattering were not isotropic, but all possibilities of DCS and exit channel were not examined at this time. In general, high-angle scattering leads to a tailing of ion energies to lower energies. Unfortunately, little is known about the DCSs of the NO^- states in this energy region.

Electron Energy Width: The electron emitter used was a symmetrically-biased, hairpin tungsten filament. Our text [1] describes this erroneously as a "spiral-wound" filament. The latter was replaced by the former before the DA experiments were started, but the text didn't quite catch up. Emission from the hairtip occurs from a small region of the tip, taken here to be 0.5 mm long. The voltage drop across the filament is 1.5 V, and the total hairpin length is about 11 mm. This gives an energy drop across the emitting length of the tip of $1.5 \times 0.5/11 \times 1.1 = 0.08$ eV, where the factor of 1.1 is an estimate of the higher voltage drop across the higher resistance at the hot tip. This energy width agrees with its measurement in the present apparatus of 0.4 eV using a straightforward retarding-potential difference technique on the electron beam. This value is also close to a measured width of 0.5 eV in an electrostatically-confined electron gun with hairpin emitter used previously [4]. Anyway, the electron energy width makes a small contribution to the laboratory O^- energies (see shaded bars in Fig. 2 of Ref. 1), and is not important here.

Other Work: In the past year we have studied the systems O^-/O_2, O^-/CO, and H^-/H_2. We found no inconsistencies in the number of peaks as expected from the kinematics. These studies will be published separately. They will include results of the full 3-D modeling of the collision region, the TM, and effects of DA angular distributions on intensity ratios [5]. Finally, we learned recently that three peaks in the O^-/NO system had been measured, but not published, by Tronc and Schermann [6][7]. They identify the channels as in Ref. 1. They observe a very small $^4S^o / ^2P^o$ DCS ratio, of about 3×10^{-3} at scattering angles of 90° and 120° [6]. No ratios were reported at scattering angles near 0°. The difference of intensities between Ref. 1 and Ref. 6 could be due to a DCS for the $^4S^o$ channel strongly peaking at low angles, which would be permitted if this were, for example, an NO^- $\Pi \rightarrow \Pi$ transition [8]. The forward scattering is included in our measurements and simulations, but was not studied in Ref. 6. A complete angular coverage of the type in Ref. 6 would help clarify the intensity issue. In summary, the presence of *three* exit channels for the process O^-/NO is noted using two very different experimental approaches [1][6]. We stand by our results based on earlier work [1] and the present full 3-D fields-and-trajectories modeling. We are unable to explain the discrepancy with Ref. 2 and conclude that its source must lie elsewhere.

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